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SOME CERCOSPORÆ FROM ALABAMA.

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The genus *Cercospora Fres.* comprises a great number of species of leaf fungi producing effects in their hosts frequently termed, in common parlance, "blight," or "leaf blight." The species are all probably more or less parasitic, varying in different degrees of intensity, as obligate parasites, from the forms occurring in dying parts of leaves, languid leaves, upon plants physiologically diseased or of low vitality, induced sometimes by overcrowding and thus preventing necessary circulation of air among the parts or entrance of sunlight; at other times through imperfect assimilation caused by defective drainage, careless preparation and care of the soil, so that the unfavorable physical condition of the soil prevents proper nutrition; by impoverished soil which predisposes the plant to a hastened and unnatural maturity: to perhaps a few cases of a more virulent nature where quite healthy plants are injured from their attacks.

The nature of this parasitism, in general as above described, would suggest to the thoughtful and progressive cultivator of the soil the necessary remedy in each case.

The genus belongs to one of the great groups of fungi known as the *Hyphomycetes*. Its members, along with many others, are sometimes termed "imperfect fungi," because they are not *autonomous; i. e.*, they represent, as is supposed, not complete individuals in themselves, but only a transitory form, or stage, of a polymorphic fungus, the perfect condition of the individual being some species of *Sphærella* or other ascomycetous fungus. Thus they stand only as the conidial stage of more or less complex life cycles. It is quite probable that in this respect they are analogous to other conidial forms, of the nature of which we have more positive knowledge, for example the Powdery mildews (*Erysipheæ*), Downy mildews (Peronosporeæ), etc., so that the conidial stage can reproduce itself successively for several generations without the intervention of the perfect, or ascigerous, stage. Therefore there is not a true, or strictly obligate, alternation of generations such as obtains in the *Muscineæ*, *Filices*, etc.

In but few of the species has the perfect stage been discovered. The writer has given an account of the perfect stage of *Cercospora gossypina* in the Bulletin of the Torrey Botanical Club, Vol. XVIII, p. 300 (*Sphærella gossypina* Atkinson). Pammel (Bulletin No. 13, Iowa Agr. Exp. Sta., May, 1891) is of the opinion that *Cercospora angulata*, on currants and gooseberries, is connected with *Sphærella Grossulariæ*, and that *Septoria Ribis* is also connected with the same perfect fungus. If this should be confirmed, then we have here a *Cercospora* forming one of the stages of a trimorphic fungus possessing conidial, spermogonial, and ascigerous stages. *Cercospora ariæ* Fkl. is considered the conidial stage of *Sphærella cinerascens* Fkl., and *C. radiata* Fkl. of *S. Vulneriæ* Fkl. (Sacc. Syl. Fung., Vol. I, pp. 493, 503). Probably one reason why the perfect stage of but few has been found lies in the fact that in many cases this stage is only developed after

the leaves have fallen to the ground and become more or less disorganized or fragmentary and the evidences of the *Cercospora* have disappeared.

While the species are not autonomous, and we thus possess only fragmentary evidence, as it were, of the characters of the complete individual, the peculiarities of form, grouping, markings, color, dimensions and effect upon their hosts are such as to offer comparatively satisfactory data for the systematist to characterize and arrange them. It is fortunate that this is so, because of their parasitic habit it is quite important that we can arrive even approximately at the limitations of the species on the different hosts.

It may seem surprising at first, to one unfamiliar with the growth of these forms and the reactionary influence of their hosts, that so many species are at present known, and that the probability is the number will even yet be increased. The specific physiological differences of the various hosts as well as the structural variations of their leaves, the differences in texture, thickness, and the varying power which the different species possess through their vital processes to resist the growth of the parasite, all exert a powerful influence upon its form and characteristics. Here we have the coincidence of several quite effective agencies, all which tend to produce variations in the parasite. It is quite possible to conceive how during a long period of time a few forms widely distributed over a great number of hosts have become more and more unlike each other and finally more firmly fixed in the possession of peculiar characteristics. This is even more probable when we consider that quite likely during much of this time the hosts themselves have been differentiating more and more so that now well-marked specific differences appear in hosts that long ago were alike and harbored the parasite which has kept pace with them in descent.

The action of the Cercospora parasite on the host results

in most cases in the death of the affected part of the leaf, producing a marked appearance in contrast with the unaffected portions, usually termed a "spot." One or more of these spots occur on a leaf, their form varying from circular to angular, or irregular to very indefinite. In many cases the resulting color changes, due to a partial disorganization of the chlorophyl, to a development of erythrophyl or other coloring substances, gives variety to the circumference of the diseased areas or to surfaces of the leaf opposite that on which the fungus is located. In a number of cases there are no well defined spots, but the fungus is diffused over small or large areas of leaf surface, giving to those areas the characteristic color peculiar to the species, being roseate in *C. effusa* (B. & C.) Ell., ferrugineous in *C. lateritia* Ell. and Hal., etc. In the case of *C. catenospora* Atkinson the fungus is diffused over large areas of leaf surface and quite injurious, producing a decided "leaf curl."

The vegetive portion of the fungus consists for the most part of colorless mycelium made up of filamentous, septate bodies irregularly interlaced among themselves and the cells on the interior of the diseased portions of the host. These contain protoplasm, they grow by longitudinal extension and division of their end cells and by branching. Further formation of cells probably takes place by the division of older cells. Their nourishment is obtained by absorbing materials from the cells of their host.

Following the vegetive condition is the conidial stage. Provision is made for the production of conidia and their easy dissemination by means of specialized fungus threads, or fruiting hyphæ, properly *conidiophores*, usually termed briefly by systematists *hyphæ*. These arise in more or less divergent or compact fascicles, which stand perpendicularly to the leaf surface and project beyond it. In a few cases some of the vegetive threads ramify on the surface of the leaf and produce conidiophores in a diffuse manner. The

fascicles, or tufts, of conidiophores arise from a more or less compact fungus body termed a *stroma*. This is formed at various points on the vegetive mycelium within the leaf tissue by a lateral growth of certain of the cells together with a conjunction of cells of adjacent threads. In *C. Bœhmeriæ* Pk. this consists of a prominent globose body; from this there are different degrees of compactness and rotundity down to a few closely associated cells which bear only a few conidiophores.

The conidiophores themselves vary greatly in length, size, general direction, markings and color. They may be continuous, septate, geniculate, flexuous, toothed, or cylindrical. The geniculations, the denticulation and much of the flexuous condition is brought about by the manner of growth of the conidiophore while it is bearing conidia. In nearly all the species the conidia are, as termed in some cases, lateral and acrogenous in their production on the conidiophores; *i. e.*, they are borne both laterally and terminally. This is not, strictly speaking, true, but only appears so to be after several conidia have been produced from a single conidiophore. Probably all of the conidia are primarily acrogenous and only later appear to be lateral after the conidiophore has grown at one side beyond the apex on which the conidium was developed. If the conidiophore is growing very rapidly the new growth, which pushes out at one side of the apex on which the conidium is situated, will extend to a considerable distance before another conidium is borne at the new apex. This again grows out past the new conidium, and so on. If the new growth of the conidiophore has been quite divergent from its primary direction a geniculation, or abrupt bend, will appear at the point where the conidium was attached. After the second conidium is borne the conidiophore will usually diverge in a different or opposite direction, giving a somewhat zigzag appearance. At each one of these

angles will be a scar left by the abscised conidium. If the onward growth of the conidiophore is not divergent, but follows its primary direction, then a shoulder will frequently appear where the conidium was abscised, or the new growth may occur so soon as to turn the apex with its scar to one side, when the conidiophore will be nearly cylindrical with scars distributed along its sides. In some cases like the latter the production of conidia is very rapid also, so that no sooner has the conidiophore begun to grow past the conidium than it bears another conidium, and thus two or more scars may be left very near each other on a cylindrical conidiophore. If several conidia are thus borne very near one place the conidiophore is apt to be somewhat enlarged at this point, especially if it is characteristic for the species that the scar is left on a minute protuberance. A case of this kind has come under my notice in *C. papillosa* Atkinson. When the growth of the conidiophore beyond its fruiting apex is not very rapid and at the same time in a direction divergent from its primary direction it will appear denticulate or jagged.

The conidiophores are farther marked by *vacuoles* or *guttulæ* in some cases, as well as by the possession of some coloring substance, brown, reddish, olive, fuliginous, etc.

The conidia are usually elongated and filamentous, hyaline or colored, usually septate, cylindrical, terete, obclavate, or tereti-fusoid. In their early development from the apex of the conidiophore they are marked off from the latter by a strong constriction, the union between the two being quite frail. If it does not meet with any mishap it continues to grow by elongation, receiving its nutrition through the small point of contact with the conidiophore. At first it appears as a small oval or elliptical or clavate body, which as it grows elongates, loses it clavate form, and assumes one of the forms described above. The great variation in length of the conidia of the same species is influ-

enced partly by the length of time during which it remains in communication with the conidiophore, but probably more by the climatic conditions, rainy, or damp, weather conducing to a very long growth. Even when conidia are separated from the conidiophores and placed under suitable conditions for germination they will frequently increase in length by apical growth or extension.

The conidia germinate readily in an abundance of moisture, a germ tube being put forth by any or all the cells. In my observations, and they have extended over several species, usually the cell first to produce a germ tube is the basal cell, and the primary direction of this tube is in a line parallel with that of the conidium but in an opposite direction from the apex. This is not universal, but occurs in such a great majority of cases as to be worthy of note. Since writing the above, in examining conidia of *Cercospora Petersii* (B. & C.) from Rav. Fung. Am., 166 (*Helminthosporium Petersii* B. & C.), kindly loaned me by Professor B. T. Galloway, I found a conidium which had germinated, a single germ tube from the basal cell was directed in the way mentioned above.

I have made several attempts to grow conidia of *C. gossypina* in nutrient agar, both with and without an infusion of cotton leaves. Mycelium is formed abundantly, which forms a dark olive-brown mass, many of the fungus threads cohering into stout compact strands several millimetres in length, but in no case have conidia been produced in such cultures with me.

Some remarks are necessary here upon one anomalous species described in the present paper, viz., *C. catenospora*. This is the first species of *Cercospora* that has been described with catenulate spores. Confined strictly to the limitations imposed by Saccardo (Vol. IV, pages 381 and 382, of his Sylloge Fungorum) this species would be placed in division C "*conidia catenulate*," and would there constitute a new

genus, since it differs too widely from *Sporoschisma* or *Dendryphium* to be placed in those genera. It might with equal propriety be placed as a new genus among the phragmosporous division of the Family *Mucedineæ* (p. 188), near *Ramularia* or *Cercosporella*, the conidiophores being prominent and quite distinct from the conidia. With the exception of this last character it agrees well with *Septocylindrium*. Here we encounter one of the difficulties of the artificial system of classification which exists to a great extent in the arrangement of some of the *Hyphomycetes*, where such genera as *Ramularia* and *Cercosporella* structurally very closely related to *Cercospora* are made to do duty in an entirely different family. If we consider the variation allowed, and justly so I think, in the genus *Ramularia*, where the conidia are either single or catenulate, this species, in all other respects a true *Cercospora*, is properly located in that genus. This variation between catenulate or not catenulate conidia exists in this one species.

The species enumerated and described below have been collected in Alabama during the last two years, mostly in the vicinity of Auburn. For a short time during the summer of 1891, Mr. C. L. Newman was engaged in my laboratory and some of the collections were made by him. I have been greatly aided in the work of collecting material, preparation of notes and determination of host plants by my assistant, Mr. B. M. Duggar. For the determination of some of the more troublesome hosts I am indebted to Dr. Geo. Vasey, Botanist to the Department of Agriculture at Washington, and to Professor S. M. Tracy, Director of the Miss. Agr. Exp. Station.

Of the seventy-nine species enumerated twenty-eight are here described as new and three varieties are added. One European species (*C. cerasella* Sacc.) and one South American (*C. Bolleana* (Thüm) Speg.) are here described for the first time, I believe, in the United States. The lat-

ter I reported in the April (1891) number of the Agricultural Journal, Montgomery, Ala. Two species, one credited to Cooke & Ellis and the other to Ellis & Everhart, are, I believe, also described for the first time. One other species is added by reducing *Helminthosporium Petersii* B. & C. to synonymy.

One other species, heretofore described as *Cercospora persica* Sacc. and later as *Cercosporella persica* Sacc. (Fung. Ital., tab. 67; Sylloge Fung., Vol. IV, p. 218), is excluded. During September, 1890, I collected it at Gold Hill and recognized it as a *Fusarium*. It should read *F. persicum* (Sacc.).

The measurements of conidiophores and conidia are given in terms of the micromillimetre.

There are a few references to numbers of specimens collected by Langlois in Louisiana. These specimens were deposited in the herbarium of the Ala. Polyt. Inst. by C. L. Newman, who received them as exchanges.

Mr. J. B. Ellis has kindly favored me with several specimens for comparison and has examined notes and specimens of a few species. Like favors from others are mentioned in connection with the species.

1. Cercospora cerasella Sacc. Spots amphigenous, rusty brown, brighter above with dark border, 2—4 *mm.* Hyphæ amphigenous, fasciculate, fascicles clustered in center of spot or in two or three clusters in different places, olive reddish brown, continuous, subgeniculate or dentate toward apex, 30—50 × 3.5—4. Conidia same color but of a lighter shade, obclavate to acuminate, 5—10—septate, guttulate, 40—75 × 3.5—4.5.

I have compared my specimens with No. 16 fascicle 1 of Brioso et Cavara's Funghi Parassiti delle Piante Coltivate od Utile, and they agree in all essential respects except that the spots in the latter are not well defined, but this may be due to the fact that the leaf in the fascicle I have

had access to was probably quite well matured and somewhat yellowed when attacked.

On cultivated cherry (ox heart) leaves (*Prunus avium?*) 1835*a*, Gold Hill, September, 1890, Atkinson; 1968, Auburn, July, 13, 1891, Newman.

2. Cercospora Zinniæ E. & M. Spots small, whitish, with broad indefinite dirty brown border, or numerous small white spots in large confluent brown areas. Hyphæ epiphyllous, loosely fasciculate, 40—80 × 4—4, 5, reddish brown, straight or abruptly geniculate and denticulate toward apex, septate. Conidia obclavate, hyaline, multiseptate, 50—100 × 4—4, 5.

On leaves of *Zinnia multiflora,* 2156, Auburn, summer, 1890, Atkinson.

3. Cercospora cercidicola Ell. Spots amphigenous, dark brown to blackish with indefinite border of dirty yellow, suborbicular, veins of leaf prominent, 3—6 *mm.* Hyphæ mostly hypophyllous, fasciculate, lower half closely and compactly parallel, spreading above, where they are subflexuous, subnodose and prominently denticulate, reddish brown, septate and multiguttulate, 70—160 × 4, 5. Conidia faintly colored, obclavate to tereti-fusoid, 1—5 septate, guttulate, 30—50 × 5—6.

Agrees with N. A. F. 1246, but spots of the latter are darker bordered; the raised border seems to be due to the prominent veins which frequently limit the areas.

On leaves of *Cercis Canadensis*, 2016, Auburn, August 7, 1891, Newman and Duggar.

4. Cercospora omphakodes E. & Holw. Spots brown, black bordered, circular, 2—3 *mm.* Hyphæ amphigenous, fasciculate, subgeniculate and denticulate, bright reddish brown, 30—60 × 4. Conidia slender, terete, dilutely reddish, 4—6 septate, 50—60 × 3.

On leaves of *Phlox Floridana*, 1190, Auburn, June 23, 1890, Atkinson.

5. Cercospora personata (B. & C.) Ell. Spots amphigenous, circular, dark brown, ususally darker below, frequently arched below, 2—4 *mm.* Hyphæ mostly hypophyllous, frequently also epiphyllous, densely fasciculate, reddish brown, usually short and continuous, toothed, or 50—70 long, septate and subgeniculate 5—7 in diameter. Conidia obclavate, 30—50 × 5—7, or up to 70 long, pale olive brown, 3—10—septate. Agrees in all respects with N. A. F. 2480.

On leaves of *Arachis hypogea*, 2157, Auburn, September 7, 1891, Atkinson, also collected at Columbia, S. C., November 17, 1888.

6. Cercospora occidentalis Cooke. Spots much as in *C. personata*, hyphæ amphigenous, paler than in specimens of *personata*. Conidia vary more, being up to 170 long, paler also in color and frequently cylindrical. The oblong spores are not all uniseptate as stated by Berkely (Grev. III, p. 106) but frequently 3—5 or more septate and the long obclavate ones are multiseptate. Thumen's specimens (1964, *C. personata* var. *Cassiæ* Thüm. Myc. Univ.) also agree with mine, the oblong spores not being one septate, but usually several times septate. I consider it quite distinct from *C. personata*.

On leaves of *Cassia occidentalis*, 1547, Auburn, July, 1890, Atkinson; 2128, Duggar. In the latter the clusters of hyphæ are in small patches or widely diffused, no distinct spots. In this respect all the specimens I have seen differ more or less from those of *C. personata* on *Arachis hypogea*.

7. Cercospora moricola Cke. Spots brown, large, irregular. Hyphæ hypophyllous, fasciculate, few in a cluster, reddish brown, septate, denticulate toward apex, 40—70 × 4, 5—5. Conidia hyaline, long, slender, terete, 10—20—septate, straight or curved, 70—200 × 4.

The leaves are injured by another fungus and the spots

cannot be well defined. The conidia are stouter than described by Cooke (Grev. XII, p. 30) and Ellis (Jour. Mycol. I, p. 34) and many times more septate, but the septation of long conidia is very variable. It is probably only a variation of Cooke's species.

8. Cercospora Diodeæ Cke. Spots amphigenous, light brown with narrow raised border bounded by dark brown above, suborbicular or semicircular on edge of leaf. Hyphæ epiphyllous, rarely hypophyllous also, in dense tufts from a tuberculate stroma, short, 10—30 × 4—5, reddish brown, longer ones septate and toothed. Conidia slender, terete, fuscidulous, 3—5—septate, 30—100 × 2, 5—3.

On leaves of *Diodea teres*, 1987, Auburn, July 16, 1891, Duggar and Newman.

9. Cercospora Tephrosiæ n. sp. Spots amphigenous, small, angular or suborbicular, 1—2 *mm.*, elevated, blackish brown. Hyphæ epiphyllous, fasciculate, fascicles crowded, reddish, flexuous or dentate, 50—100 × 4, 5—5. Conidia obclavate, subhyaline and tinge of same color as hyphæ, 5—8—septate, usually straight, 70—130 × 4—4, 5.

On leaves of *Tephrosia hispidula*, 2105, Auburn, September 14, 1891, Atkinson.

10 Cercospora truncatella n. sp. Spots amphigenous, suborbicular, whitish with narrow light brown border, 2—4 *mm.* Hyphæ amphigenous, fasciculate, reddish brown, septate, geniculate or nearly straight, conidial scars distributed along at geniculations, 70—250 × 4, 5. Conidia hyaline, faintly septate, tapering very gradually from truncated base to obtuse apex, rarely rounded at base, 50—150 × 3, 5—4. Very different from *C. fusco-virens.*

On leaves of *Passiflora incarnata*, 2025, Auburn, August 26, 1891, Atkinson.

11. Cercospora Agrostidis n. sp. Spots amphigenous, broadly elliptical, very light brown center with broad bor-

der of dull red brown, 3—5 *mm.* long. Hyphæ amphigenous, loosely fasciculate, tufts irregularly scattered and few in a spot, bright reddish brown, septate, nearly straight to subflexuous and sparingly toothed near apex, 40—65 × 3, 5—4. Conidia hyaline, 1—7—septate, terete, straight or little curved, 10—60 × 2, 5.

On leaves of *Agrostis*, 2036, Auburn, July 23, 1891, Duggar and Newman.

12. Cercospora citrullina Cke. On leaves of watermelon (*Citrullus vulgaris*), 1581, Sept. 3, 1890, Atkinson. Specimens are not now at hand, not having been preserved. It agrees well with Cooke's description (Grev. XII, p. 31). The only notes I have in my record are as follows: "Amphigenous, conidia several times (5—9) septate. Affects leaves near base of stem first and gradually progresses toward other extremity."

13. Cercospora Cucurbitæ E. & E. Spots suborbicular, amphigenous, subochraceous, then whitish bordered by brown, 2—4 *mm.* Hyphæ epiphyllous, fasciculate, dull olive reddish brown, lighter toward apex, septate, subgeniculate and sparingly toothed or scarred toward apex, 70—200 × 4—4, 5. Conidia hyaline, slender, terete, straight or curved, multiseptate, 50—120—200 × 3—4.

On leaves of "dish-rag" squash, (*Cucurbita?*) 2154*a*, Auburn, 1890, Atkinson; *Lagenaria vulgaris*, 2154, September 10, 1891, Duggar.

This may be identical with *C. citrullina* Cke.

14. Cercospora pachyspora E. & E. Spots amphigenous, dark brown with concentric elevated lines and indefinite yellowish border, suborbicular, 4—10 *mm.* Hyphæ amphigenous, more numerous below, fasciculate, stout, dilutely ochraceous, septate, flexuous, when young nearly hyaline, 50—100 × 5—9. Conidia hyaline or dilutely yellowish, obclavate, 3—8 septate, 25—100 × 8—10.

On leaves of *Peltandra alba*, 2193, Auburn, September 26., 1891, Duggar.

15. Cercospora beticola Sacc. Spots amphigenous, possessing a blistered appearance, grayish with dark border, 1—3 *mm.* Hyphæ fasciculate, cylindrical, fuscidulous, continuous, nodulose or scarred at or near apex, 70—200 × 4—5. Conidia slender, terete, hyaline, multiseptate, 70—140 × 3.

On leaves of cultivated sugar beet (*Beta vulgaris*), 1832, Auburn, November 28, 1890, Atkinson.

16. Cercospora Vernoniæ E. & K.? Spots amphigenous, dirty greyish brown with irregular, indefinite border, variable in size. Hyphæ epiphyllous, fasciculate, mostly hyaline when young to fuscidulous, subnodose and toothed, 20—40 × 4, 5. Conidia hyaline, obclavate, slender, 3—12—septate, 70—120 × 3, 5—4.

On leaves of *Vernonia noveboracencis*, 2073, Auburn, August 29, 1891, Atkinson.

17. Cercospora flagellaris E. & M. Spots amphigenous, at first small, whitish, 2—4 *mm.*, with raised and blistered margin, bordered with indefinite red, later larger and often then confluent over dead parts of the leaf and marked frequently with concentric lines. Hyphæ amphigenous, fasciculate, pale reddish brown, septate, nearly cylindrical, undulate and nodulose above, 30—50 × 4, 5. Conidia long, abruptly slender from near the base, hyaline, multiseptate, 30—120 × 4.

On leaves of *Phytolacca decandra*, 1947, Auburn, July 11, 1891, Newman.

18. Cercospora Acalyphæ Pk. Spots on leaves amphigenous, small, numerous, with a 1—3 *mm.* white center bordered above by dark purple, below by light brown. Hyphæ amphigenous, loosely fasciculate, nearly straight or subflexuous or geniculate, prominently scarred, septate, olive brown with faint reddish tinge, 80—140 × 4, 5—5.

Conidia hyaline, terete, straight or curved, multiseptate, 50—200 × 3—4. On the stems the spots are elliptical to oblong, dirty white with dark border.

On leaves and stems of *Acalypha caroliniana*, 1998, Auburn, August 6, 1891; 2102, September 12, 1891, Newman.

19. Cercospora polygonacea E. & E. Spots ochraceous; suborbicular, 3—10 *mm.*, parts of the leaf often reddish. Hyphæ amphigenous, fasciculate, tufts numerous in center of spot, scattered toward border, when young faintly fuliginous and nearly cylindrical, in age plainly reddish brown, septate, subflexuous and denticulate, 30—80 × 4, 5. Conidia hyaline, obclavate, straight or curved, faintly septate, 50—100 × 4—5.

On leaves of *Polygonum dumetorum* var. *scandens*, 2225, Auburn, October 14, 1891, Duggar. Specimens were submitted to Ellis.

20. Cercospora Lobeliæ K. & S. Spots amphigenous, dirty white with dark indefinite purple border, usually small, irregular, 2 - 6 *mm.* Hyphæ amphigenous, more numerous above, fasciculate from tuberculate base, strongly denticulate, olive brown when young with reddish tinge to reddish brown in age, 10—150 × 4, 5—5, long ones subgeniculate. Conidia faintly colored obclavate, septate and sometimes constricted, 50—100 × 4, 5.

On leaves of *Lobelia amœna*, 2226, Auburn, October 14, 1891, Atkinson. Specimens of this were submitted to Professor Kellerman.

21. Cercospora rhuina C. & E. Spots amphigenous, above dull reddish brown bordered by black, or entirely black and often with indefinite red border, in age sometimes becoming greyish in center, light brown below, frequently arched upward, with or without a narrow elevated border. Hyphæ densely fasciculate, amphigenous, from tuberculate stroma, dull reddish brown, irregularly flexu-

ous, torulose, or denticulate 30—150 × 3—4. Conidia nearly cylindrical to very narrowly tereti-fusoid, or obclavate, and curved, 3—5—multiseptate, faintly olive-fuscidulous, 25—120 × 3—4.

On leaves of *Rhus copallina*, 1178, Auburn, June 30, 1890, *R. toxicodendron*, 1181, June 30, 1890; *R. venenata*, 1304, Shorter's Station, July 16, 1890; *Rhus* sp. undetermined, 1565, Auburn, August 6, 1890, Atkinson; *Rhus glabra*, 2014, Auburn, August 7, 1891, Duggar and Newman. On *R. toxicodendron* both the hyphæ and conidia are more slender than on the other species, and the conidia longer, many times more septate and very frequently guttulate. The variations, however, considering other very striking resemblances, do not seem sufficient to separate it.

22. Cercospora canescens E. & M. Amphigenous, in large dead areas, or spots 2—6 *mm.*, brown or dirty grey with narrow dark border above. Hyphæ amphigenous, fasciculate, brown, septate, nearly cylindrical, stout, 50—100 × 5. Conidia hyaline, obclavate, 3—8-septate, nearly straight, 30—120 × 4, 5—5, 5.

On leaves of cultivated bean (*Phaseolus vulgaris*), 1983, Auburn, July 25, 1891, Newman.

23. Cercospora avicularis Wint, var. sagittati n. var.? Spots amphigenous, light brown with narrow elevated margin frequently bordered by reddish brown, 2—3 *mm.*, Hyphæ olive brown, frequently with reddish tinge, fasciculate, septate, sometimes subgeniculate to denticulate, 70—170 × 4. Conidia faintly colored, septate, 100—300 × 3, 5.

On leaves of *Polygonum sagittatum*, 2201, Auburn, October 1, 1891, Duggar.

24. Cercospora Liquidambaris C. & E. Spots amphigenous, dirty white above, brown below, small, numerous, irregular with a blistered appearance. Hyphæ fasciculate from tuberculate base, dark reddish brown, short,

flexuous, torulose, septate, and minutely guttulate, 20—100 × 4—4, 5. Conidia subhyaline or tinged with olive, terete, straight or curved, 45—150 × 3, 5—4.

On leaves of *Liquidambar styraciflua*, 2227, Auburn, October 14, 1891, Atkinson. In Jour. Mycol., Vol. IV, p. 115, as a note appended to *C. tuberculans* E. & E., Ellis says: "This is very different from *Cercospora Liquidambaris* C. & E., which is on definite spots." This is the only published notice of the species of which I have any knowledge. Ellis writes me that he does not know whether a description has ever been published, but that there is a specimen in his herbarium marked *C. Liquidambaris* C. & E. This is probably the same as No. 77 of Langlois' collection, of which I have a specimen marked *C. Liquidambaris* E. & E. At first sight it would appear quite different from my specimens, for the spots are brown above, orbicular and quite large. There are, however, numerous whitish, small, blistered spots, and a few of these are changing to brown. I should say that Langlois' specimens were in a more advanced condition than mine. The chief difference in the fungus is that in my specimen the conidia are much longer and more nearly hyaline. This can be accounted for by the fact that I could find no conidia in my specimens until I had placed them for twenty-four hours in a moist chamber, where the conditions were favorable for rapid growth.

25. Cercospora anthelmintica n. sp. Spots small, amphigenous, 1—3 *mm.*, white with narrow raised margin surrounded by dark border. Hyphæ epiphyllous, fasciculate, spreading, subflexuous, subnodnose and profusely toothed, septate, fuliginous with faint reddish tinge, 30—100 × 4—4, 5. Conidia hyaline, terete, 4—10 septate, 25 100 × 4—4, 5. Different from *C. Chenopodii.*

On leaves of *Chenopodium ambrosioides* var. *anthelminticum*, 2037, Auburn, August 27, 1891, Duggar.

26. Cercospora Jussiææ n. sp. Epiphyllous, small white spots surrounded by indefinite reddish purple border. Hyphæ fasciculate, reddish, septate, geniculate and denticulate toward apex, 40—120 × 4—4, 5. Conidia hyaline, obclavate, 3—10—septate, 100—150 × 4.

On *Jussiæa leptocarpa*, 2159, Auburn, September 2, 1891, Duggar; *J. decurrens*, 2191, Auburn, September 29, 1891, Atkinson.

27. Cercospora fusimaculans n. sp. Spots amphigenous, light brown bordered by dark brown, broadly fusoid or elliptical, 3—4 *mm.* long, frequently confluent. Hyphæ epiphyllous, fasciculate, olive reddish brown, straight, subgeniculate or nodulose, sparingly denticulate toward apex, septate, 50—100 × 4—4, 5. Conidia small, hyaline, 3—4 septate, tapering little toward each end, 25—40 × 2.

On leaves of *Panicum dichotomum*, 2054, Auburn, August 15, 1891, Duggar.

28. Cercospora Setariæ n. sp. Spots amphigenous, dark with indefinite pale border, elliptical. Hyphæ epiphyllous, dull reddish brown, fasciculate, sometimes very dense, others divergent, sometimes branched from near base, septate, with a few small guttulæ, scars small, giving denticulate appearance near apex, 50—100 × 4, 5—5. Conidia hyaline, 1—pluriseptate, cylindrical or obclavate, straight or curved, 20—150 × 4—5.

On leaves of *Setaria glauca*, 2120, Auburn, September 17, 1891, Duggar.

29. Cercospora asterata n. sp. Spots amphigenous, about 6 *mm.* in diameter, generally in edge of leaf, dirty grey bordered by black, exterior to this effused with reddish purple. Hyphæ amphigenous, fasciculate, dull reddish brown, subhyaline at tips, septate, geniculate, subflexuous, torulose to denticulate, minutely guttulate, 70—

120 × 4, 5. Conidia hyaline, nearly cylindrical, tapering gradually to each end, septate, 30—50 × 3.

On Aster, 2365, Auburn, November 25, 1891, Atkinson.

30. CERCOSPORA RICHARDIECOLA n. sp. Spots amphigenous, black with small white center and concentric lines suborbicular, 2—6 *mm.* Hyphæ epiphyllous, fasciculate, faintly fuliginous when young with reddish tinge, reddish brown in age, usually straight but sometimes geniculate or subflexuous to denticulate toward apex, 10—80 × 5. Conidia hyaline, obclavate, 4—10 or more septate, 50—100 × 3—4.

On leaves of *Richardia Africana*, 2111, Auburn, September 7, 1891, Atkinson. Very different from *C. Callæ* Pk. & Clint.

31. CERCOSPORA ALABAMENSIS n. sp. Spots amphigenous, dirty white definitely limited by dark purple or black with raised margin, 2—3 *mm.* Hyphæ amphigenous, loosely fasciculate, fascicles numerous, faintly septate, dilutely reddish brown, nearly straight, denticulate, or abruptly shouldered and prominently scarred at angles, 50—100 × 4, 5. Conidia long, slender, straight or curved, hyaline, closely multiseptate, terete, 70—250 × 3—4. This is quite different from specimens collected by Prof. Galloway in Missouri, which have been referred by Ellis to *C. Ipomææ* Winter, and specimens of which have been kindly furnished me by Galloway and Ellis.

On *Ipomæa purpurea*, 1248, Uniontown, July 12, 1890, Atkinson.

32. CERCOSPORA FLAGELLIFERA n. sp. Spots amphigenous, suborbicular to angular 3—4 *mm.* or large and indefinitely limited (this may be due to presence of other fungus), dark brown above, lighter below. Hyphæ amphigenous, rather compactly fasciculate or spreading, reddish brown, prominently scarred and flexuous and denticulate toward tips, or cylindrical, 40—150 × 4, 5. Conidia

hyaline, very long and slender, multiseptate, 70—250 × 2, 5—3 at base.

On leaves of *Galactia pilosa*, 2180, Auburn, September 9, 1891, Atkinson; *Lespedeza?* 2117, September 17, 1891, Duggar. The spots are different on *Lespedeza?*, being angular and nearly black above, and rather small, while in *Galactia pilosa* they are quite large and indefinitely limited. The fungus, however, seems to be the same. It is quite different from *C. latens*.

33. Cercospora papillosa n. sp. Spots orbicular or irregular, sometimes in edge of leaf, dirty white, 2—5 *mm*. Hyphæ amphigenous, fasciculate, nearly straight, denticulate to papillate, the scars sometimes being on minute protuberances. In some cases I have seen them several in a whorl, reminding one of the appearance of some sexual shoots of some algæ of the family *Lemaneaceæ*, fuliginous with very faint brick-red tinge, 50—70 × 4, 5—5. Conidia hyaline, long, rather stout at base, usually tapering rather abruptly into slender, thread-like apical portion, multiseptate, sometimes faintly so, 80—200 × 4—4, 5 at base.

On leaves of cultivated *Verbena*, 2376, Auburn, December 24, 1891, Atkinson.

34. Cercospora Hydrangeæ E. & E. Spots large, angular, limited by veins, blackish above, frequently becoming whitish in center, light brown below. Hyphæ amphigenous, fasciculate from tuberculate base, olive brown with dull reddish tinge in age, subgeniculate and denticulate, 40—70 × 4—4, 5. Conidia hyaline, long, slender, terete, curved, multiseptate, 70—150 × 3—4.

On leaves of cultivated *Hydrangea*, 1013, Auburn, 1890, Atkinson. Specimens of this sent over a year ago to Ellis were marked *C. Hydrangeæ* E. & E. I think this is the first published description and Ellis' name is given.

35. CERCOSPORA DESMODII E. & K. Spots small, 2—3 *mm.*, angular, amphigenous, light brown, numerous, frequently confluent. Hyphæ mostly hypophyllous, fasciculate, 4—8 from tuberculate base, light reddish brown, septate, undulate and sometimes geniculate, 40—80 × 4—5. Conidia hyaline, terete, slender, faintly septate, 30—80 × 25—35.

On leaves of *Desmodium*, 1241, Uniontown, July 12, 1890, Atkinson; Cultivated *Desmodium* (Florida clover), Auburn, 1890, Atkinson.

36. CERCOSPORA SOLANICOLA n. sp. Spots small, white, dark border, or indeterminate on dead areas of the leaf. Hyphæ fasciculate, olive brown with faint reddish tinge, straight to flexuous or geniculate toward apex, 3—5 septate, 40—120 × 5. Conidia hyaline, terete, obtuse, 10—30 septate, 100—230 × 4, 5.

On leaves of *Solanum tuberosum*, 1922, Auburn, June 19, 1891, Atkinson.

37. CERCOSPORA GALII E. & Hol. Spots amphigenous, irregular, large, greyish brown. Hyphæ amphigenous, fasciculate from tuberculate stroma, septate, fuliginous, short, 15—20 × 4—5. Conidia straight or flexuous, faintly 1—6 septate, dilutely yellowish, terete, 40—70 × 3—4.

On leaves of *Galium pilosum*, var. *puncticulosum*, 1318, Auburn, July 22, 1890, Atkinson.

38. CERCOSPORA VIOLÆ Sacc. Spots amphigenous, white, 2—6 *mm.*, suborbicular, sometimes confluent. Hyphæ amphigenous, fasciculate, nearly straight, long ones sometimes subflexuous and subdenticulate, fuliginous, sometimes with reddish tinge, 30—70 × 4—5, in rainy weather frequently 150—300 long. Conidia hyaline, long, slender, terete, multiseptate and nearly straight, 100—200 × 3, 5—4.

On leaves of *Viola odorata*, 1946, Auburn, July 25, 1891; *Viola cucullata*, 2372, December 14, 1891, Atkinson.

39. Cercospora nymphaeacea E. & E. Spots amphigenous, subcircular, 2—4 *mm.*, nearly the entire disk is of a leaden color from profuse development of the fungus, bordering this is a narrow ring of dirty grey color, margined by indefinite purple, which is separated from the grey ring by slightly elevated ring. Hyphæ epiphyllous, densely fasciculate, fascicles crowded, short 10—20 × 3, fuliginous with olive tinge. Conidia very slender, tapering very little toward apex, hyaline or subhyaline, 8—multiseptate, curved or flexuous, 80—120 × 2, 5—3.

On leaves of *Nymphea odorata*, 2160, Auburn, September 2, 1891, Duggar.

40. Cercospora Saururi E. & E. Spots black above, light brown below, suborbicular, 3—6 *mm.*, with a broad, ill-defined border of yellow. Hyphæ amphigenous, fasciculate, short, nearly straight, faintly fuliginous, 10—20 × 4—5. Conidia hyaline, terete, straight or curved, few to pluriseptate, 30—140 × 3, 5—4, 5.

On leaves of *Saururus cernuus*, 1303, Shorter's Station, July 16, 1890, Atkinson.

41. Cercospora Rubi Sacc. Spots amphigenous, brown with frequently a light center, bordered by red above, irregular and frequently confluent. Hyphæ epiphyllous, fasciculate, spreading from tuberculate base, short, continuous, faintly fuliginous, tufts black, numerous, 3, 5—4 in diameter. Conidia acrogenous, terete, slender, faintly colored, 30—100 × 2, 5—3.

On leaves of *Rubus cuneifolius*, 1130, December, 1889; 1536, August 8, 1890; 1764, September 4, 1890, Auburn, Atkinson. In 1536 the red border of the spots is suffused with yellow.

42. Cercospora Bœhmeriæ Pk. Spots amphigenous, at first limited by the veins of the leaf, in age sometimes orbicular with indefinite yellowish border, 3—6 *mm.* Hyphæ hypophyllous from rotund tuberculate stroma,

fuliginous, nodulose, continuous, usually short, up to 50 long by 4—4, 5. Conidia fuliginous with faint olive yellowish tinge, 3—5 septate, guttulate, tapering little toward each end, but more toward apex, 40—75 × 4—4, 5.

On leaves of *Bœhmeria cylindrica*, 2321, November 7, 1891, Auburn, Atkinson. Also collected at Shorter's Station, July 16, 1890. These latter specimens were young and the spots distinctly angular.

43. Cercospora Hydrocotyles E. & E. Spots amphigenous, light brown, orbicular, with narrow elevated margin and indefinite border of dark brown, 3—4 *mm.*, somewhat arched upward. Hyphæ amphigenous, fasciculate, tufts evenly distributed, faintly fuliginous, continuous or sometimes faintly septate, straight or subgeniculate to toothed near apex, 30—50 × 4—4, 5. Conidia hyaline or subhyaline, slender, terete, multiseptate, sparingly guttulate, 30—70 × 2, 5—3.

On leaves of *Hydrocotyle umbellata*, 1308, Shorter's Station, July 16, 1890, Atkinson.

44. Cercospora Mali E. & E. Spots amphigenous, light brown below, greyish above, subcircular, 3—4 *mm.* Hyphæ amphigenous, fasciculate from dark tuberculate stroma, very short, fuliginous, 3, 5—4 in diameter. Conidia hyaline, very slender, terete, 3—7—septate, 30—75 × 2, 5—3.

On leaves of *Pirus malus*, Gold Hill, September, 1890, Atkinson. These specimens do not agree very well with N. A. F. 2478, the hyphæ being much shorter and the conidia not colored. The material is scanty and it does not seem best to separate it.

45. Cercospora Elephantopodis E. & E. Spots brown with dirty yellowish indefinite border, orbicular, less distinct on under surface. Hyphæ epiphyllous, very short, scarcely raised above the tuberculate stroma, faintly fuliginous. Conidia long, very slender, straight or curved,

pluriseptate, dilutely yellowish, 25—120 × 2, 5—3. This is probably a young stage, since in N. A. F. 1757 the hyphæ are amphigenous and well developed.

On leaves of *Elephantopus tomentosus*, 1179, Auburn, June 30, 1890, Atkinson.

46. Cercospora atramaculans E. & E. Spots amphigenous, suborbicular, 4—8 *mm.*, light brown to nearly black. Hyphæ amphigenous, fasciculate, tufts distributed thickly over the spot, divergent, sometimes branched, subflexuous, irregular in outline, denticulate, septate and guttulate, olive fuliginous with reddish tinge in age, 30—80 × 4. Conidia very narrowly tereti-fusoid, or narrowly lanceolate, 3–10 septate, guttulate, faintly fuliginous, 20—70 × 3, 5—4.

On leaves of *Cassia Tora*, 2129, Auburn, September 10, 1891, Atkinson.

47. Cercospora cruenta Sacc. Spots orbicular mottled by blood-red splotches. Hyphæ amphigenous, fasciculate, tufts distributed over spot, short or quite long, faintly olive fuliginous, not reddish brown when long, as in *C. Dolichi*, septate, flexuous, simple or branched, 40—150 × 4. Conidia faintly olive, frequently guttulate, septate, 40—120 × 4.

On leaves of *Dolichos sinensis*, 1238, July 18, 1890; *Phaseolus* (cultivated), 1236, July 18, 1890, Auburn, Atkinson.

48. Cercospora viticola (Ces.) Sacc. Spots suborbicular with indefinite ragged border, blackish above or brown in center with black border, light brown below, affected parts of leaf outside of the spots frequently changing to yellow. Hyphæ amphigenous, parallel and densely fasciculate in compact column 100—300 long, individual hyphæ septate, free for short distance at distal end where sometimes subclavate, abruptly subflexuous, jagged and denticulate when having borne many conidia, sometimes

divergent at distal end, though not nearly so much so as in *C. cercidicola* and *C. Petersii* (B. & C.), though the sterile part of the fascicle is much more compact than in the latter species. Hyphæ, where compacted into bundle 3, 5—4 in diameter, usually somewhat greater, 4—5, at the free ends, dark olive brown. Conidia obclavate, abruptly tapering at base, usually curved, 3—12 septate, sometimes very distinctly so, same color as the hyphæ, though more dilute, 40—70 × 4—7.

Common on cultivated grape leaves (Vitis), Auburn, Atkinson.

49. Cercospora Petersii (B. & C.). *Helminthosporium Petersii* B. & C., Grev. III., p. 102 (*ex-parte?*), *Helminthosporium Petersii*, Rav. Fung. Am. Ex., 166. Spots amphigenous, light brown in center, with blackish border, orbicular, 2—3 *mm.* Hyphæ amphigenous, mostly hypophyllous, fasciculate, very dark olive brown to nearly black, septate, 100—300 × 4—4, 5, for about two-thirds their length parallel and quite closely compacted into a bundle, not so much so as in *C. viticola*, distal one-third divergent and very profusely subflexuous, denticulate, torulose, jagged, and diameter somewhat greater than the straight portion. Conidia obclavate or narrowly teretifusoid, abruptly acuminate, resembling in form those of *C. cerasella*, but much darker in color, dark olive brown, 2—6 septate, 30—70, even sometimes to 100 × 5—6 at base.

This is very different from *C. smilacis*, Nos. 1676 and 1768 Myc. Univ., the conidia there being much narrower, the hyphæ shorter and otherwise quite different. It differs also from N. A. F. No. 1251. It also seems to be quite different from Saccardo's description of his *C. smilacina* (l. c.) and the figure in F. Ital., No. 681, but may be identical. I have not seen specimens of Peck's *C. Smilacis* and cannot say whether or not it is the same as this species, but I am inclined to think it is; the

spores in a young condition may sometimes be hyaline. Prof. B. T. Galloway, Chief of the Division of Veg. Pathology, has kindly permitted me to examine the specimen of *Helminthosporium Petersii* in Rav. Fung. Am., 166, from *Smilax*. It is identical with my specimens from Alabama. I have no doubt that B. & C.'s specimens on *Smilax* are the same. I have not seen the fungus on *Laurus Benzoin* and I have arranged the synonymy for the specimens on *Smilax*.

On leaves of *Smilax glauca*, 1288, Shorter's Station, July 16, 1890; 2375, Auburn, December 20, 1891, Atkinson.

50. CERCOSPORA LUDWIGIÆ n. sp. Spots amphigenous, subcircular, irregular, reddish brown or purple, sometimes with white in center, 1—3 *mm.* Hyphæ epiphyllous, densely fasciculate from tuberculate base, short, olive brown or faintly fuliginous, straight or flexuous, 20—30 × 4, 5. Conidia slender, terete, straight or curved, sometimes guttulate, 3—10 septate, faintly colored, 25—100 × 2, 5—3.

On leaves of *Ludwigia alternifolia*, 2190, Auburn, September 29, 1891, Atkinson.

51. CERCOSPORA D. VIRGINIANÆ n. sp. Spots amphigenous, brown or dirty white with a broad, ill-defined purple border above, 2—5 *mm.* Hyphæ amphigenous, fasciculate, tufts numerous, fuliginous, nearly straight, denticulate, 40—250 × 4—5. Conidia hyaline, stout at base, tapering to long, slender apical portion, multiseptate, 80—350 × 4.

On leaves of *Diodia virginiana*, 2186, Auburn, September 26, 1891, Duggar.

52. CERCOSPORA CRINOSPORA n. sp. Hyphæ fasciculate, 3—6 in a tuft, undulate, sparingly toothed and nearly hyaline at apex, dark brown for nearly the entire length. Conidia very slender, straight, terete, hyaline, 4—6 septate, 20—60 × 1, 5—2.

On dead parts of leaves of *Rhyncospora glomerata*, 2034, Auburn, August 27, 1891, Atkinson.

53. CERCOSPORA ATRAMARGINALIS n. sp. Spots amphigenous, orbicular, 4—6 *mm.*, light brown or dirty grey with black border above. Hyphæ hypophyllous, fasciculate from stroma, short, flexuous or denticulate, continuous, faintly fuliginous, 10—30 × 4—4, 5. Conidia obclavate or cylindrical, 1—10 septate, guttulate, yellowish, 10—70 × 4—5. Different from *C. Physalidis* E. & E., N. A. F. 2299, and from other forms on *Solanum*.

On leaves of *Solanum nigrum* (?), 1359, Auburn, 1890, Atkinson.

54. CERCOSPORA TROPÆOLI n. sp. Spots amphigenous, very light brown with narrow elevated margin above, suborbicular, 2—4 *mm.* Hyphæ epiphyllous, few in cluster, stout, short, faintly fuliginous, 20—40 × 5, dentate. Conidia hyaline, rather stout at base and quickly tapering into long, slender apical portion, reminding one of *C. flagellaris*, multiseptate, 50—150 × 3, 5—4, 5 at base.

On leaves of cultivated *Tropæolum*, 2110, Auburn, September 7, 1891, Atkinson.

55. CERCOSPORA TESSELATA n. sp. Spots indefinite above, usually narrowly oblong, nearly black below with bluish tinge caused by numerous black tufts and bluish cast of leaf tissue affected. Hyphæ hypophyllous, densely fasciculate, fuliginous, short, 10—12 × 2, 5—3, denticulate, tufts in longitudinal and usually transverse rows, giving a checkered appearance to the group. Conidia slender, hyaline, terete, curved, septate, 50—90 × 2—2, 5.

On languid leaves of *Elusine Ægyptica*, 2306, Auburn, November 6, 1891, Atkinson.

56. CERCOSPORA SERIATA n. sp. Spots amphigenous, cinereous with definite brown border margined by indefinite yellow, irregularly oblong, sometimes confluent. Hyphæ epiphyllous, fasciculate, faint reddish brown, in age darker,

flexuous and toothed, 20—50 × 4, tufts in parallel rows. Conidia hyaline, nearly cylindrical, straight or curved, faintly 2—6 septate, 30—70 × 3—3, 5.

On leaves of *Sporobolus asper*, 2009, Auburn, July 24 and August 7, 1891, Duggar and Newman.

57. CERCOSPORA DAVISII E. & E. Spots brown, subcircular. Hyphæ amphigenous, brown, nearly straight, denticulate near tips, fasciculate, 30—90 × 5. Conidia subhyaline or very faintly yellowish, nearly straight, 5—8 multiseptate, cylindrical or terete, 80—140 × 3, 5—4, 5.

On leaves of *Melilotus alba*, 1268, Uniontown, July 12, 1890, Atkinson.

58. CERCOSPORA ALTHÆINA Sacc. Spots angular, amphigenous, dirty white with narrow black border, 2—3 *mm.* Hyphæ amphigenous, fasciculate, fuscidulous, geniculate or toothed at apex, continuous, 30—50 × 4—5. Conidia hyaline, slender, terete, multiseptate, straight or lightly curved, 30—100 × 3, 5—4, 5.

On leaves of *Althæa rosea*, 1253, Uniontown, July 12, 1890, Atkinson.

Var. MODIOLÆ, n. var. Spots same but little smaller, with narrow raised margin. Hyphæ amphigenous, fasciculate, fuscidulous, continuous, cylindrical, 30—70 × 4, 5. Conidia hyaline, slender and tapering to very narrow apical portion, multiseptate, 50—100 × 3—4.

On *Modiola multifida*, 1253*a*, Auburn, 1890, Atkinson.

59. CERCOSPORA SILPHII E. & E. Spots angular, amphigenous, black or dirty grey with black border, 2—4 *mm.* Hyphæ amphigenous, fasciculate from black base, tufts numerous distributed over the spot, fuliginous with reddish tinge, toothed, longer ones septate, usually 15—25, but up to 70 × 4—5. Conidia obclavate, usually somewhat curved, faintly olive, yellowish tinted, 3—6—septate, 50—100 × 3, 5—5.

On leaves of *Silphium compositum*, 1198, Auburn, June 30, 1890, Atkinson.

60. CERCOSPORA THASPII E. & E. Spots angular, black frequently bordered by indefinite yellow, in age becoming lighter in center, bordered by veinlets frequently, thus giving the appearance of a narrow raised margin, 2—3 *mm.* Hyphæ amphigenous, subfasciculate, 3—8 in a cluster, dark reddish brown, stout, 5—8—septate, guttulate, 70—160 × 5—6, irregularly flexuous, geniculate and sometimes branched. Conidia obclavate, hyaline, stout, closely multiseptate, 60—120 × 5—6 at base.

On leaves of *Angelica hirsuta*, 1540, Auburn, July 22, 1890, Atkinson; 2042, July 23, 1891, Duggar and Newman.

61. CERCOSPORA DEPAZEOIDES (Desm.) Sacc. Spots amphigenous, angular or suborbicular, light brown below, black or greyish above with raised margin. Hyphæ amphigenous, fasciculate, not strongly divergent, distantly septate, dull reddish brown, irregularly flexuous, 100—200 × 4, 5. Conidia faintly tinged with same color, obclavate, septate, guttulate, 50—100 × 4, 5.

On leaves of *Sambucus canadensis*, 1760, Auburn, September 9, 1890, Atkinson.

62. CERCOSPORA SAGITTARIÆ E. & K. Spots amphigenous, angular or suborbicular, light brown, then blackish with indefinite border of a lighter color. Hyphæ epiphyllous, fasciculate, tufts few, fuliginous, simple, denticulate above. Conidia hyaline, straight or curved, obclavate, septate, stout, 40—100 × 4—5. This differs considerably from N. A. F. 1502, but is probably only a variation from that form.

On leaves of *Sagittaria variabilis*, 2039, Auburn, July 24, 1891, Duggar and Newman.

63. CERCOSPORA BOLLEANA (Thüm.) Speg. Spots yellowish and indefinite on upper surface, rusty beneath and

angular, darker in center. Hyphæ hypophyllous, fasciculate, light olive brown, flexuous or toothed, obscurely septate, 40—70 × 4, 5—5. Conidia lanceolate or terete-fusoid, 1—5—septate, obtuse, faintly olive yellow, 20—45 × 5—8.

On languid leaves of *Ficus carica*, 1772, Auburn, September 4, 1890, Atkinson.

64. Cercospora Clitoriæ n. sp. Spots angular, rather large, 3—6 *mm.*, black or nearly black above, brown below. Hyphæ epiphyllous, fuliginous, short, projecting little above the tuberculate stroma, 5—10 long. Conidia long, slender, terete, faintly colored, straight or curved, several times septate, 50—70 × 3.

On leaves of *Clitoria mariana*, 2069, Auburn, August 29, 1891, Atkinson.

65. Cercospora effusa (B. & C.) Ell. Hypophyllous, diffuse, giving roseate color to large patches or entirely covering the under surface of the leaf. Hyphæ fasciculate, individuals sometimes creeping and producing numerous branches, geniculate, dentate, reddish, hyaline at tips, 45—100 × 4. Conidia cylindrical, tapering at each end, 1—3 septate, subhyaline, multiguttulate, 25—40 × 4—4, 5.

On leaves of *Lobelia amœna*, 2214, Auburn, October 11 and November 3, 1891, Atkinson.

66. Cercospora Dolichi E. & E. The leaf possesses suborbicular or angular spots mottled with blood-red much as in *C. cruenta*. The hyphæ are not confined to them, but distributed over the green areas of the leaf as well. Hyphæ amphigenous, loosely fasciculate, olive fuliginous, short, subflexuous, subdenticulate and usually somewhat pointed at the apex 20—40 × 4—4, 5, or up to 80 long, then with reddish tinge and plainly septate. Conidia olive, terete, 3—15—septate, curved, usually guttulate, 30—100 × 4.

On leaves of *Dolichos sinensis*, 1246, Uniontown, July 11, 1890, Atkinson.

67. CERCOSPORA DIOSPYRI Thüm var. FERRUGINOSA n. var. Hyphæ tufted, tufts numerous, collected into olive black orbicular patches on under side of the leaf. Leaves pale green above at the affected places. Hyphæ ferrugineous, irregularly flexuous, closely septate, often branched, rough, jagged, strongly notched and papillate, 50—150 × 4, 5. Conidia obclavate, tapering abruptly toward base, more gradually toward apex, faintly olive yellowish to ferrugineous and dark brown, 1—12 or more septate, septa close and more distinct toward base, in age strongly constricted at septa and nucleolate, 20—80 × 4, 5—5, 5 at base. The conidia are much stouter than in 1273 Myc. Univ. and darker colored even when young. Hyphæ there more slender and continuous as described by Ellis (Jour. Myc., Vol. 1, p. 51). His description is apparently taken from specimens in Thuemen's Myc. Univ., since it agrees with the ones I have examined from that work. Specimens collected by Langlois, 600, in Louisiana, agree with my specimens from Alabama.

On leaves of *Diospyros virginiana*, 2254, Auburn, September 26, 1891, Duggar.

68. CERCOSPORA SORDIDA Sacc. Tufts of Hyphæ forming angular patches limited by the veins, or covering larger portions of the under side of the leaves, dirty grey or nearly black, upper surface yellowish. Hyphæ subfasciculate, divergent, subflexuous, nodulose, denticulate, septate, guttulate, olive reddish brown, 20—70 × 4—4, 5. Conidia faint olive reddish tinge, multiguttulate, multiseptate, terete, curved or flexuous, 20—110 × 3, 5—4, 5.

On leaves of *Tecoma radicans*, 2149, Auburn, September 13, 1801, Atkinson.

69. CERCOSPORA FUSCOVIRENS Sacc. Hypophyllous, spots colored by hyphæ dirty yellowish green, limited by

the veins, indefinite yellowish spots above. Hyphæ fasciculate, faintly olive reddish brown, septate, frequently branched, subflexuous and denticulate toward apex, 30—70 × 4—4, 5. Conidia dilutely yellow, multiseptate and multiguttulate, very long and slender, terete, 70—150—300 × 3, 5—4, obtuse at distal end, abruptly tapering at base. The spores differ greatly in size from Ellis' and Saccardo's descriptions, but the great length of the conidia is probably due to different climatic conditions.

On leaves of *Passiflora incarnata*, 2198, Auburn, October 2, 1891, Duggar.

70. CERCOSPORA JATROPHÆ n. sp. Spots indefinite, at first yellowish above and dirty yellow below from hyphæ first developing below, when badly attacked and old hyphæ are amphigenous and then the spots dirty grey with indefinite yellow border. Hyphæ fasciculate from yellowish brown stroma, dilutely yellowish brown, short, subflexuous, 10—20 × 3. Conidia long and slender, hyaline or subhyaline, 5—12—septate, tapering little to distal end, 50—100 × 1, 5—2.

On leaves of *Jatropha stimulosa*, 1171, Auburn, July 2, 1890, Atkinson.

71. CERCOSPORA MACROGUTTATA n. sp. Hypophyllous forming small oval or larger narrowly oblong patches, olive brown in color, from the profusion of the development of the fungus. Hyphæ long, flexuous, geniculate, sparingly toothed near apex, multiseptate and multiguttulate with large guttulæ, dark brown in age with olive tinge, growing tips and young ones decidedly olive green tinge, 100—250 × 5—6. Conidia nearly cylindrical, very narrowly tereti-fusoid, dilutely olive green, 3–8–septate, 10–80 × 4, 5—5.

On leaves of *Chrysopsis graminifolia*, 2138, Auburn, July 13, 1891, Atkinson.

72. CERCOSPORA PINNULÆCOLA n. sp. Diffuse, hy-

pophyllous, giving dirty appearance to under surface of the pinnules, which are usually paled above. Hyphæ in loose tufts distributed over affected area, reddish brown, septate, minutely guttulate, irregularly flexuous, geniculate and profusely denticulate, 100—200 × 4, 5. Conidia obclavate, hyaline, multiseptate and multiguttulate, 50—150 × 4—5.

On leaves of *Cassia nictitans*, 2197, Auburn, October 1, 1891, Duggar.

73. Cercospora erythrogena n. sp. Hypophyllous, spots indefinite, usually reddening the leaf above, giving dirty appearance to large portion of under surface of the leaves. Hyphæ scattered, frequently creeping, often branched, septate, dull reddish brown, flexuous, denticulate, 50—70 × 4, 5. Conidia slender, usually curved, longer ones terete, faintly olive brown, multiseptate and usually guttulate, 30—100 × 3, 5—4.

On leaves of *Rhexia mariana*, 1541, Auburn, July 22, 1890; *Rhexia* sp. 1819, October, 1890; *R. virginica*, 2066, August 29, 1891, Atkinson.

74. Cercospora rigospora n. sp. Spots indefinite or absent, but parts of leaf affected, usually obscurely yellowish above. Hyphæ hypophyllous, fasciculate, divergent, in sooty patches sometimes very indistinct, or distributed over large areas, fuliginous with olive tinge, subflexuous, denticulate or torulose, longer ones faintly septate and multiguttulate, 50—60 × 3, 5—4. Conidia straight or curved, subcylindrical, abruptly tapering at each end or terete, 3—10—septate, multiguttulate, dilutely olive yellow, 50—70 × 3—4. This is very different from *C. Solani* Thum as shown in Myc. Univ., 270, and also from *C. diffusa* Ell., specimens of which I have seen, both of those being much stouter and the conidia quite different in texture, easily collapsing, while those of *C. rigospora* are quite firm. Ellis' *diffusa* seems to me on comparison

identical with Thümen's *Solani*. Specimens collected by Langlois, 1322, in Louisiana and marked *C. Solani*, agree quite well with Ellis' *diffusa* and are quite different from my specimens.

On leaves of *Solanum nigrum*(?), 1225, Auburn, July 5, 1890, Atkinson.

75. Cercospora catenospora n. sp. Diffused in irregular patches or over large surface of under side of leaves, giving dirty green color. Hyphæ fasciculate from stomata of leaf, divergent, 20—30 up to 75 × 5—6, septate, nearly cylindrical, often toothed, bearing conidia laterally as well at the apex, olive yellowish, rarely darker and inclined to faint reddish tinge. Conidia lateral and acrogenous, concatenate or single, cylindrical when concatenate and then abruptly tapering each way to small truncate end, terete when single, more rarely slightly clavate, dilutely olive yellowish, often guttulate, 1—6 septate, 20—100 × 4—5.

On leaves of *Sambucus canadensis*, 2045, Auburn, August 27, 1891, Atkinson. The leaves are severely injured by the fungus, which causes them to curl and fall, so that in many cases the shrubs are entirely denuded of their leaves.

76. Cercospora Erechtitis n. sp. On dead parts of the leaf. Hyphæ epiphyllous, fasciculate, reddish brown, geniculate or scarred, in which case hyphæ are cylindrical, frequently guttulate, 50 240 × 4. Conidia hyaline, septate and guttulate, 70—230 × 3—4.

On leaves of *Erechtites hieracifolia*, 2303, Auburn, November 5, 1891, Duggar.

77. Cercospora gossypina Cooke. Spots light brown or dirty white, irregular, often bordered by a dark or purple color, frequently without spots appearing on large dead or dying areas of the leaf. Hyphæ amphigenous, fasciculate, brown, geniculate or toothed, 70—450 × 5—7.

Conidia hyaline, few to multiseptate, terete, 70 400 × 3—4.

On leaves, bracts and cotyledons of *Gossypium herbaceum.*

78. CERCOSPORA LIRIODENDRI Ell. & Hark. I have not collected good specimens of this, but my notes read as follows: "Differs from *C. Liriodendri* (as described) in having conidia 70 long and several times septate."

On leaves of *Liriodendron Tulipifera*, 1951, Auburn, July 11, 1891, Newman.

79. CERCOSPORA CEPHALANTHI E. & K. I have several times collected specimens of this with characteristic spots, but the hyphæ and conidia were so poorly developed it was impossible to take any notes worthy of record.

On leaves of *Cephalanthus occidentalis.*

A NORTH CAROLINA CATALAN OR BLOMARY FORGE.

BY HUNTER L. HARRIS.

This forge is situated on Helton Creek, near its union with North Fork of New River, in Ashe county. It is remarkable as an example of a process for obtaining iron which is now becoming extinct. Briefly, it is the process by which a mass of malleable iron is obtained by heating together in an open hearth a mixture of a pure ore of iron with charcoal, until the carbon monoxide from the charcoal unites with the oxygen of the ore and reduces the ore. There were formerly a number of such forges in that region, but all others have long since disappeared.

This forge was built perhaps fifty years ago by John Ballou; was rebuilt by W. J. Paisley in 1871, and has